

REMARKS

Claims 1-20 are pending in the present application. Claims 5-11 are canceled above. Claims 1, 12, 14, and 18 are amended above. New claims 21-41 are added above. No new matter is added by the claim amendments or new claims. Entry is respectfully requested.

The Applicant notes that the Office Action Summary does not indicate whether the drawings filed in the application are acceptable. Confirmation of their acceptability is respectfully requested.

Claims 1-20 are objected to for reasons stated in the Office Action. Claims 1, 12, 14, and 18 are amended above in a manner that is believed to overcome the objections. Entry is respectfully requested.

The applicants note with appreciation that page 5, second paragraph, of the Office Action indicates that independent claims 12 and 18 would be allowable if amended to overcome the stated objections. It is submitted that independent claims 12 and 18 are amended above in a manner that is believed to overcome the objections. Entry of the amendments, removal of the objections, and allowance of claims 12 and 18 are therefore respectfully requested.

The applicants note with appreciation that page 5, first paragraph, of the Office Action indicates that dependent claims 7, 8, 13-17, 19, and 20 would be allowable if written in independent form. Independent claim 1 is amended above to include the limitations of former claim 7. New independent claim 21 includes the limitations of original claims 1 and 8. Claims 13-17 are dependent on independent claim 12, which is amended above in a manner that is believed to overcome the objections stated above. Claims 19 and 20 are dependent on independent claim 18, which is amended above in a manner that is believed to overcome the objection stated above. Entry of the amendments, removal of the rejections, and allowance of claims 1-4 and 12-24 are therefore respectfully requested.

Claims 1-6 and 9-11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Han, *et al.* (U.S. Patent Number 6,215,143 - hereinafter "Han"), in combination with Lee, *et al.* (U.S. Patent No. 6,287,910 - hereinafter "Lee"). These rejections are believed to be no longer applicable in view of the foregoing amendment of independent claim 1 and the cancellation of claims 5, 6, and 9-11. Removal of the rejections is respectfully requested.

With regard to the invention as claimed in new independent claims 25, 29, 34, and 38, a "primary wet treatment" is performed on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode. Subsequent to performing the primary wet treatment, a "secondary wet treatment" is performed to remove a remaining residue of unwanted surface oxides and unwanted surface organic materials from the surface of the lower metal electrode. In independent claim 25, the "primary wet treatment" is performed using an "etchant containing LAL," and the "secondary wet treatment" is performed using an "etchant containing H<sub>2</sub>SO<sub>4</sub>." In independent claim 29, the "primary wet treatment" is performed using an "etchant containing SC1," and the "secondary wet treatment" is performed using an "etchant containing H<sub>2</sub>SO<sub>4</sub>." In independent claim 34, the "primary wet treatment" is performed using an "etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof," and the "secondary wet treatment" is performed using an "etchant containing H<sub>2</sub>SO<sub>4</sub>." In independent claim 38, the "primary wet treatment" is performed using an "etchant containing HF," and the "secondary wet treatment" is performed using an "etchant containing H<sub>2</sub>SO<sub>4</sub>."

Han is cited in the Office Action as disclosing a method for manufacturing a DRAM cell capacitor (see Han, column 2, lines 23-29 and column 4, lines 38-50). The method disclosed in Han includes an etching process to pattern a conductive layer 110 using a patterned photoresist layer 112 and a polymer layer 113 as a mask, and thereby forming a capacitor storage electrode 110a (see Han, Figs. 3B-3C and column 5, lines 15-20). Next, the photoresist layer 112 and polymer 113 are removed using an ashing or H<sub>2</sub>SO<sub>4</sub> stripping process (see Han, column 5, lines 32-33). Next, the substrate is washed by being dipped in a washing liquid, such as a mixture of

NH<sub>3</sub>, H<sub>2</sub>O<sub>2</sub>, and deionized water, or SC1 solution (see Han, column 5, lines 34-36). Following additional processing to add hemi-spherical grain (HSG) features, a portion of an insulating layer 106 is etched using a mixture of a LAL solution and SC1 solution (see Han, Fig. 3D and column 5, lines 52-55). After the insulating layer 106 is etched, the substrate is washed using a washing liquid, such as SC1 and HF solution (see Han, column 5, lines 57-59). A capacitor dielectric layer and capacitor top electrode are then formed (see Han, column 5, lines 60-63).

Lee is cited in the Office Action as disclosing the use of titanium nitride as the material used for forming the upper and lower electrodes of the capacitor.

It is submitted that the combined teachings of Han and Lee fails to teach or suggest the present invention as claimed in new independent claims 25, 29, 34 and 38. In particular, the combination of Han and Lee fails to teach or suggest “performing a primary wet treatment on a surface of the lower metal electrode...” and “subsequent to performing the primary wet treatment, performing a secondary wet treatment on the surface of the lower metal electrode...,” wherein the “primary wet treatment” is performed “using an etchant containing LAL” and the “secondary wet treatment” is performed “using an etchant containing H<sub>2</sub>SO<sub>4</sub>” as claimed in new independent claim 25, or wherein the “primary wet treatment” is performed “using an etchant containing SC1” and the “secondary wet treatment” is performed “using an etchant containing H<sub>2</sub>SO<sub>4</sub>,” as claimed in new independent claim 29, or wherein the “primary wet treatment” is performed “using an etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof” and the “secondary wet treatment” is performed “using an etchant containing H<sub>2</sub>SO<sub>4</sub>,” as claimed in new independent claim 34, or wherein the “primary wet treatment” is performed “using an etchant containing HF” and the “secondary wet treatment” is performed “using an etchant containing H<sub>2</sub>SO<sub>4</sub>,” as claimed in new independent claim 38. Instead, Han performs a treatment using an SC1 and HF solution following a series of etching steps, one of the preceding etching steps including an H<sub>2</sub>SO<sub>4</sub> stripping process. Therefore, Han fails to teach or suggest a “secondary wet treatment” that uses an “etchant containing H<sub>2</sub>SO<sub>4</sub>” that is performed “subsequent to” a “primary wet treatment” that uses an “etchant containing LAL”

(claim 25), an "etchant containing SC1" (claim 29), an "etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof" (claim 34), or an "etchant containing HF" (claim 38). In addition, Lee, like Han fails to teach or suggest the claimed combinations of first and second wet etch treatments. Accordingly, allowance of new independent claims 25, 29, 34, and 38, and claims dependent thereon, are therefore respectfully requested.

Closing Remarks

It is submitted that all claims are in condition for allowance, and such allowance is respectfully requested. If prosecution of the application can be expedited by a telephone conference, the Examiner is invited to call the undersigned at the number given below.

Respectfully submitted,

  
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